REMARKS

Applicant's counsel greatly appreciates the courtesy extended by Examiner Binda during the course of an interview conducted on March 26, 2002, and Examiner Binda's careful consideration of the arguments presented during the interview.

In response to the Official Action mailed November 16, 2001, Applicant amends his application and requests reconsideration. In the Amendment, claims 20, 21, 23, 25, 27, 29, 30 and 38 have been amended and claims 39-56 have been added. No new matter has been added. Claims 20, 21, 23, 25, 27, 29, 30 and 36-56 are now pending and under examination.

Claim 20 has been amended to more clearly define the present invention. In the interview, Applicant's counsel pointed out the support in the specification and drawings, as originally filed, for amended claim 20 (and the subject matter of new claim 44). Applicant's counsel began with a discussion of one of the objectives of the present invention. The objective is to compensate for manufacturing errors which result in misalignment between the two shaft ends (1, 2), which misalignment may make it difficult or impossible to place the ball (5) in the socket (7) (see Figure 3). In addition, because the manufacturing errors can be compensated for, less stringent manufacturing tolerances are required, resulting in lower manufacturing costs.

This objective is achieved by making the socket (7) resiliently pivotable (using a tumbler guide (30)) relative to a shaft end (2), to which the socket (7) is attached. As shown in Figure 3, for example, the socket (7) can move laterally and axially relative to the fork (6) of the shaft end (2) to compensate for misalignment between the two shaft ends (1, 2). When the two shaft ends (1, 2) are misaligned, the socket (7) will pivot either laterally or axially to compensate for the misalignment and allow the ball (5) to be properly placed in the socket (7). Each of Figures 4-8 also describes an embodiment of the resiliently pivotable socket.

Amended claim 20 is also supported by the specification, as originally filed (see, for example, the first full paragraph of page 3, and page 8, lines 12-18). The description of Figures 3-8 explains in detail how the resiliently pivotable socket works.

The specification was objected to as failing to comply with 37 CFR 1.71 and 1.75(d)(1) with regard to the subject matter of claims 20 and 29. The specification has been amended to overcome this objection (see the amendment to the first paragraph of page 8 and the last paragraph of page 10).

The disclosure was objected to because on page 12, second full paragraph, the numeral 32 should be 37. Appropriate amendment has been made to overcome this objection.

Various rejections were made under 35 USC 112, second paragraph. Applicant has amended the rejected claims to overcome the rejections.

The pending claims were rejected under 35 U.S.C. §102(b) and 35 U.S.C. §103(a) over various patents, and claims 20, 21, 27, 28, 36 and 37 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the claims of copending Application No. 09/600,556.

As discussed in the interview, none of the patent references and copending application discloses, as recited in amended claim 20, a steering shaft universal double joint that has a socket which is resiliently pivotably mounted to a shaft end (i.e., a tumbler guide as previously recited in claim 20). Accordingly, claim 20 is patentable over the cited patent references and copending application. The newly added independent claim (claim 44) is also patentable for the same reasons. All the other pending and new claims are patentable because each depends from either claim 20 or claim 44.

In light of the foregoing remarks, this application is considered to be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the

application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

Respectfully submitted,

April 16, 2002

Donald D. Evenson
Registration No. 26,160
Song Zhu
Registration No. 44,420

CROWELL & MORING, LLP
Intellectual Property Group
P.O. Box 14300
Washington, DC 20044-4300
Telephone No.: (202) 624-2500
Facsimile No.: (202) 628-8844
DDE:SZ:tlm (CAM # 37272.002)

VERSION WITH MARKINGS SHOWING CHANGES MADE

IN THE SPECIFICATION:

The first paragraph on Page 8 has been amended as follows.

A steering shaft double-cross universal joint according to the invention is represented in Figures 1 and 2. The joint consists of a coupling case 8 and a tubular dual fork 8, respectively, in which two joint crosses 9 are mounted for movement. The shaft ends 2 and 3 are jointed on one another by means of the forks 4 and 6 which are journaled on the joint crosses 9, and by means of a ball joint. [to the socket 7 by the ball neck 10 and the balls 5.] The ball joint includes a ball 5 mounted to one shaft end 2, 3 and a socket 7 mounted to the other shaft end 2, 3. The ball 5 is resiliently mounted for rotation about its center point in the socket 7 and is slidingly moveable in the direction of the shaft axis of the other shaft end 2, 3. Bellows can protect the joint against dirt.

The first full paragraph on page 10 has been amended as follows:

In Figure 3 it is furthermore to be seen that the plate springs 31 are held advantageously in an annular chamber 34 which is formed at the end of fork 6 at a shaft end. In the upper half of the figure the tumbler guide means 7, 30, is provided with a flange 33 which serves as a spring abutment and is urged against another flange 41 configured as a holding lip or claw, so that, in the rest position, it is aligned axially with the shaft axis. The [claw] flange 41 furthermore holds the friction bearing in an axial position.

The last paragraph on page 10 has been amended as follows:

In the bottom half another variant of the tumbler sleeve mounting is shown; here the tumbler sleeve 7, 30 is urged by a spring or springs 31 abutting [rim] flange 33 on the tumbler side against the [rim] flange 35 on the fork side. The springs 31 in that case thrust against the [rim or lip] flange 41 forming the chamber 34; for assembly they are held on the socket 7. In this manner, as shown in Figure 3, the tumbler sleeve 7, 30 (or the socket 7, 30) is resiliently pivotably mounted to the other shaft end and resiliently supported in the axial

direction, so that the tumbler sleeve 7, 30 can tumble resiliently about the shaft axis when subjected to a radial force. The bushing 11 is advantageously affixed to the tumbler socket 7 by holding means 32, 32.2. Advantageously this is accomplished by rim 32, at least on the side of bushing 11 remote from the fork 6. The hook of the rim 32 should overlap the bushing 11 at least to the extent that, when wear occurs and free play results it will not drop out. At the other end of the bushing 11 a retaining projection 32.1 can be provided which holds the bushing 11 in place in the other axial direction.

On Page 12, the second full paragraph has been amended as follows:

The guide [32] 37 is preferably injection molded directly into the ball 5. The variant in Figures 9b and 9a shows in longitudinal and cross section an additional preferred possibility for a damping compensation of free play in the unbiased state. The plastic sliding guide 37 is provided in its outer wall area with a plastic spring 39, which permits sliding without free play under bias V. The spring 39 is preferably made in one piece with the plastic guide 37, the spring being preferably slotted 40 so that it can breathe radially and being in contact with the inside surface of the tumbler guide 30 in a wear and tolerance equalizing manner. In Figure 10 the same plastic sliding guide as in Figure 9 is shown in the installed state. The tolerance gaps A, B, which the spring spans with respect to the tumbler guide 30, are shown schematically.

IN THE CLAIMS:

Claims 20, 21, 23, 25, 27, 29, 30 and 38 have been amended as follows:

20. (Amended) Steering shaft universal double joint for motor vehicles with shaft ends fastened against rotation in the joint, these ends being held for movement in a housing joining the two joints and the shaft ends being joined together between the two joints by a ball joint so that [the] a ball, connected to one of the shaft ends, is mounted for rotation about [its] a center point of the ball in a socket of the other shaft end and is slidingly movable in the direction of the

shaft axis of the other shaft end, wherein the socket is resiliently pivotably mounted to the other shaft end.

[wherein the ball is resiliently mounted in the socket, and

wherein the socket receives a slide bushing.]

21. (Amended) Joint according to claim 20, further comprising:

[wherein the] a slide bushing [is] held by [a] the socket [tumbler guide], the slide bushing being [preferably] enveloped at least partially by the [tumbler guide] socket and being disposed between the ball and the socket.

23. (Twice amended) Joint according to claim 21,

wherein the [resilient] resiliently pivotably mounting of the socket in the other shaft end includes metal springs[, preferably plate springs].

25. (Amended) Joint according to claim 23,

wherein the plate springs are biased against the [tumbler guide] socket, so that the shaft axis, when in the unstressed position, is aligned with the axis of the [tumbler guide] socket.

27. (Amended) Joint according to claim 20,

wherein the bushing is slotted such that [it] the bushing is resiliently movable in a radial direction.

29. (Amended) Joint according to claim 21,

wherein in an end portion of a fork, an annular chamber is formed to accommodate a pre-biased spring [resilient structure] disposed between a first [abutment] flange on the fork side and a second [abutment] flange on the [tumbler guide] socket, so that the [tumbler guide] socket can tumble resiliently about the shaft axis in case of radial action by a force.

30. (Amended) Joint according to claim 21,

wherein the bushing is held in an axial direction at at least one end by the [tumbler guide, preferably] socket by a rim or by claws.

38. (Amended) Joint according to claim 20,

wherein the universal joint contains a homokinetic joint[, such as a constant velocity joint and/or preferably a cross joint].